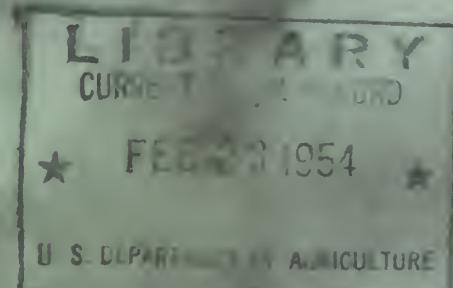


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Do not assume content reflects current scientific knowledge, policies, or practices.

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Federal - State Cooperative
Snow Surveys and Water Supply Forecasts
for
ARIZONA



**Soil Conservation Service
United States Department of Agriculture**

Data included in this report were obtained by the agency named above in cooperation with the Federal, State and local organizations listed on the last page of this report.

AS OF
FEB. 1, 1954

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TO RECIPIENTS OF COOPERATIVE SNOW SURVEY
AND WATER SUPPLY FORECAST REPORTS:

Forecasts by U. S. Weather Bureau of total annual streamflow October-September, inclusive, at more than 300 gaging stations are issued monthly January through May in the publication WATER SUPPLY FOR ECASTS FOR THE WESTERN UNITED STATES.

Weather Bureau forecasts of runoff presented in that bulletin are computed from procedures based on mathematical analysis of the relation between precipitation and runoff.

The Weather Bureau bulletins may be secured by writing to:

Hydrologist in Charge
River Forecast Center
U. S. Weather Bureau
712 Federal Office Building
Kansas City 6, Missouri

For current information on local river and flood conditions, reference should be made to the appropriate River District Office, listed below:

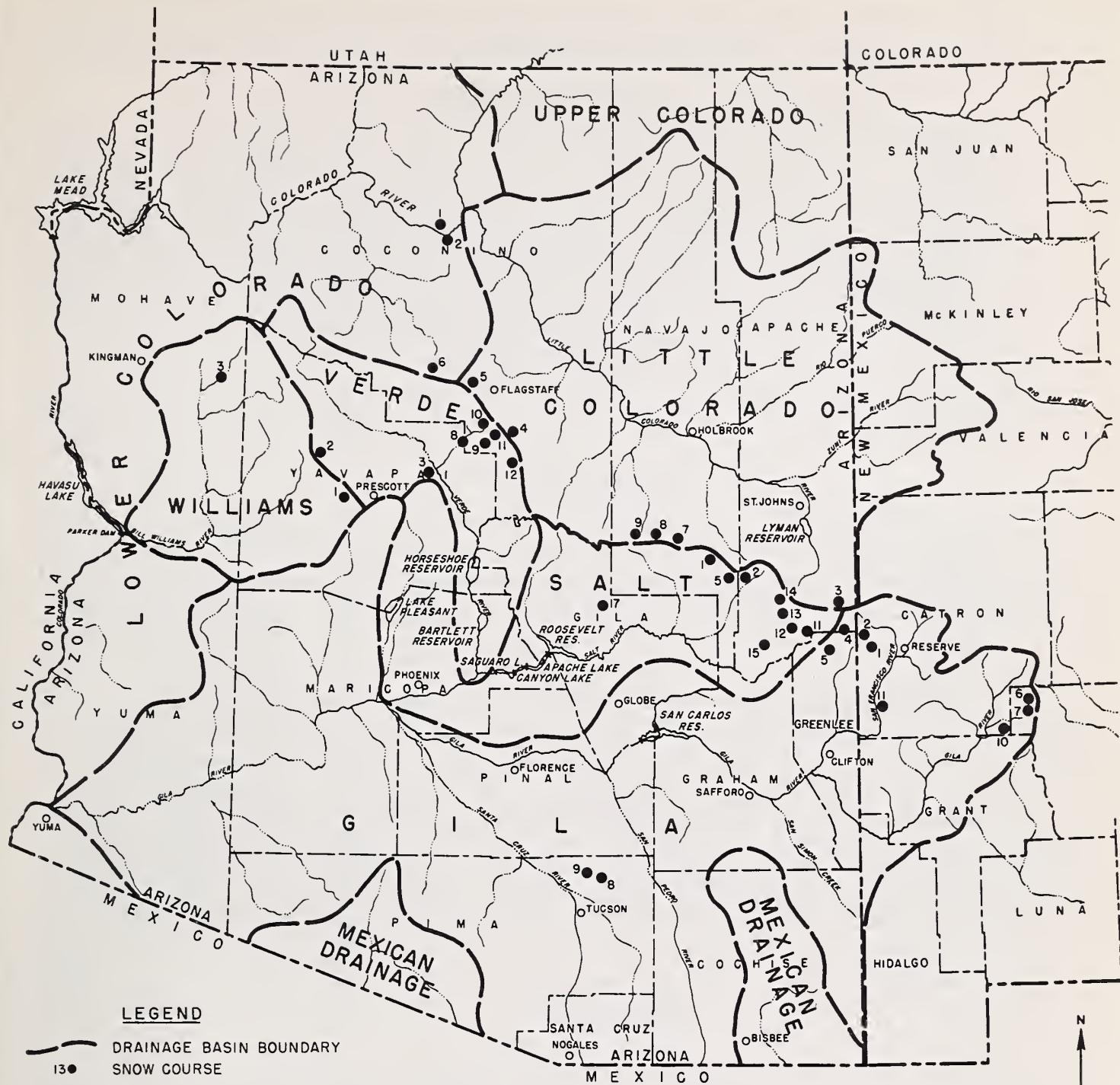
Meteorologist in Charge.....Colorado River and
Weather Bureau Airport Station tributaries in Arizona
3000 Sky Harbor Blvd., except San Juan
Phoenix, Arizona

State of Arizona

FEDERAL-STATE COOPERATIVE
SNOW SURVEYS AND IRRIGATION WATER FORECASTS
FOR
ARIZONA

Report Prepared
by
W. E. Anderson - Snow Survey Leader

Soil Conservation Service
39 North Sixth Avenue
Phoenix, Arizona



ARIZONA COOPERATIVE SNOW SURVEYS

SNOW COURSES AND DRAINAGE BASINS
JANUARY 1954

0 40 80 120 160 200
SCALE IN MILES

INDEX TO SNOW COURSES

NUMBER	NAME	SEC	TWP	RGE*	ELEVATION
<u>LITTLE COLORADO RIVER</u>					
1. Forest Dale		2	9N	21E	6,000
2. McNary		14	8N	23E	7,200
3. Nutrioso		23	6N	30E	8,500
4. Mormon Lake		13	18N	8E	7,350
5. Fort Valley		22	22N	6E	7,350
7. Gentry		36	11N	15E	7,600
8. Heber		28	11N	15E	7,600
9. Canyon Creek		18	11N	15E	7,500
11. Mormon Mountain		14	18N	8E	7,500
12. Happy Jack		30	17N	9E	7,630
<u>WILLIAMS RIVER</u>					
1. Iron Springs		22	14N	3W	6,200
2. Camp Wood		3	16N	6W	5,700
3. Willow Ranch		16	21N	11W	5,000
<u>GILA RIVER</u>					
1. Frisco Divide (N.M.)		31	6S	20W **	8,000
2. State Line (N.M.)		6	6S	21W	8,000
3. Nutrioso		23	6N	30E	8,500
4. Coronado Trail		26	5N	30E	8,000
5. Beaver Head		13	4N	30E	8,000
6. Taylor Creek (N.M.)		20	10S	10W **	7,850
7. Inman (N.M.)		6	11S	10W **	7,800
8. Rose Canyon		15	12S	16E	7,300
9. Bear Wallow		6	12S	16E	8,100
10. Black Canyon (N.M.)		8	13S	11W **	6,790
11. Mogollon (N.M.)		2	11S	19W **	7,000
<u>VERDE RIVER</u>					
1. Iron Springs		22	14N	3W	6,200
2. Camp Wood		3	16N	6W	5,700
3. Mingus Mountain		3	15N	2E	7,100
4. Mormon Lake		13	18N	8E	7,350
5. Fort Valley		22	22N	6E	7,350
6. Chalender		27	22N	3E	7,100
8. Munds Park		7	18N	7E	6,500
9. Casner Park		19	18N	8E	6,930
10. Antelope Park					7,300
11. Mormon Mountain		14	18N	8E	7,500
12. Happy Jack		30	17N	9E	7,630
<u>SALT RIVER</u>					
1. Forest Dale		2	9N	21E	6,000
2. McNary		14	8N	23E	7,200
3. Nutrioso		23	6N	30E	8,500
4. Coronado Trail		26	5N	30E	8,000
5. Milk Ranch		28	8N	23E	7,000
7. Gentry		36	11N	15E	7,600
8. Heber		28	11N	15E	7,600
9. Canyon Creek		18	11N	15E	7,500
11. Big Lake Knoll		3	5N	28E	8,800
12. Maverick Ford		13	6N	27E	9,050
13. Baldy		28	7N	27E	9,000
14. Ft. Apache		18	7N	27E	9,160
15. Pacheta		At Town of Maverick, Arizona			7,800
17. Workman Creek		33	6N	14E	6,900
<u>LOWER COLORADO RIVER</u>					
1. Bright Angel		34	33N	3E	8,400
2. Grand Canyon		21	30N	4E	7,500
5. Fort Valley		22	22N	6E	7,350
6. Chalender		27	22N	3E	7,100

* All in Gila and Salt River Base and Meridian except where otherwise indicated.

** New Mexico Principal Meridian

WATER SUPPLY OUTLOOK

ARIZONA

February 1, 1954

*
* February 1 snow surveys indicate that a serious *
* deficiency in snow stored water exists on all *
* Arizona watersheds. Unless unusual storms or *
* exceptionally heavy spring rainfall occurs, run-*
* off from snow melting may well be a record low *
* *

General

Recent storms on the upper watersheds have had little effect on the snow water content. Unseasonably clear, warm weather has caused some snow melt, resulting in a slight improvement in soil moisture conditions.

Otherwise the picture is perhaps worse than appeared on January 15. Warm sunny days have caused a ripening of the snow pack and increases in snow densities to a point where early melting may be anticipated. In some areas, generally up to about 7,500 to 8,000 feet, much of the snow has already melted with no improvement in stream flows and little noticeable effect on soil moisture. Greater than normal wind movement, coupled with low humidity and high temperatures, has contributed to evaporational losses of unusual magnitude.

Snow Cover

Snow stored water ranges significantly below normal, with some courses varying down to 20% of normal. Water content is generally comparable with last year, but extreme dryness of the soil due to lack of normal fall rainfall indicates that runoff will be much less.

San Francisco River Drainage

Snow cover is less than in either 1946 or 1951, both years of minimal runoff, and soil moisture conditions are much more critical than in those years. There is no snow on the lower elevations, and on the higher elevations it is only in scattered, protected spots on the south exposures. The water supply outlook on this stream is probably worse than in those years unless additional precipitation occurs. The maximum accumulation of snow has generally occurred by

February 15 on most of this drainage. Most of the snow that has melted so far has gone to partially restore the depleted soil moisture contents or has been evaporated. There is little noticeable effect on stream flows. The San Francisco River continues at about base flow conditions. There is still time for a late storm to occur, and should extensive spring rains occur, they would also contribute to increased runoff. As of the present, however, and in view of the Weather Bureau's long-range forecasts, the outlook is very poor.

Gila River Drainage

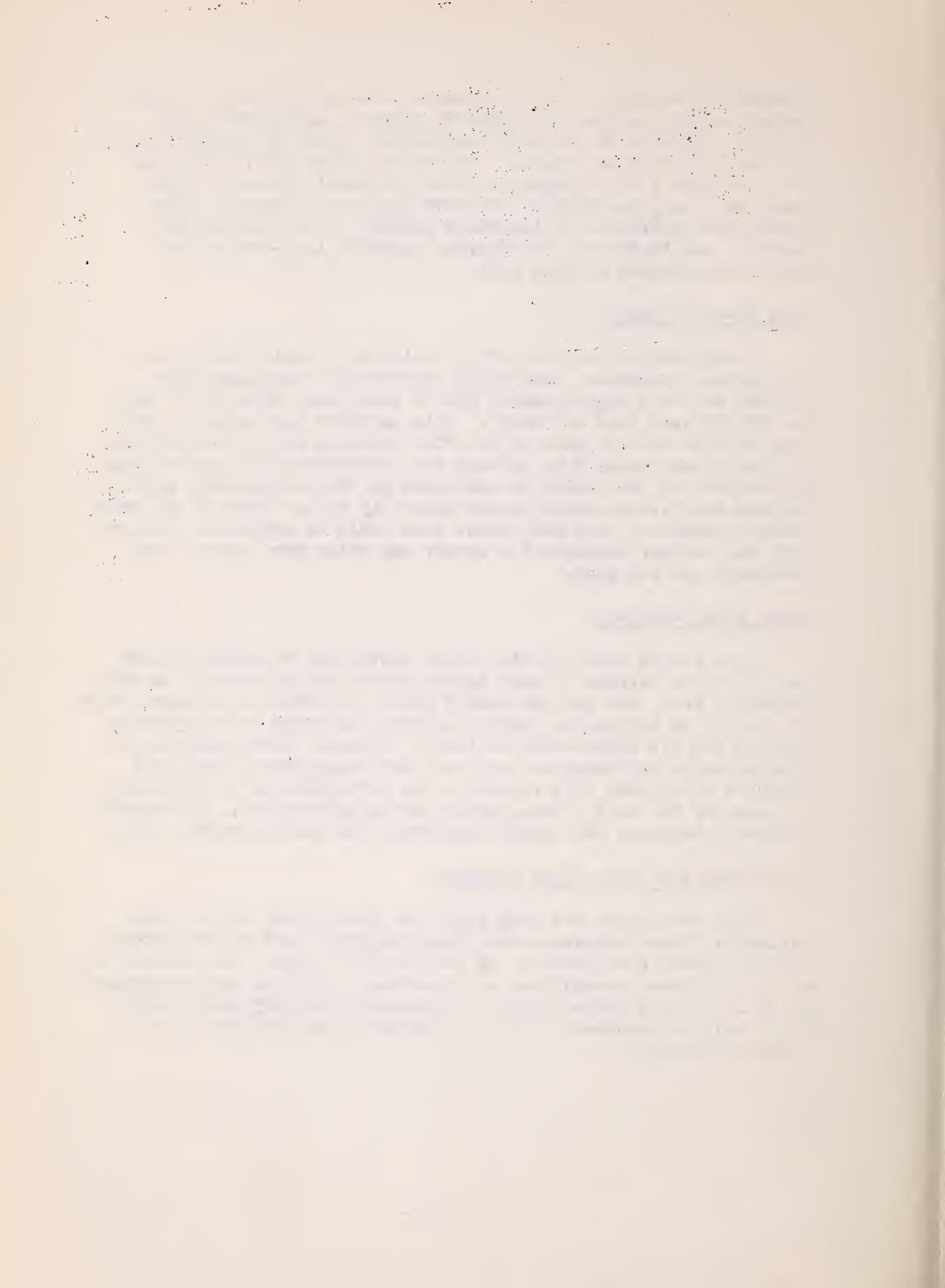
Conditions on the Gila are practically a duplicate of those on the San Francisco. Snow water contents in the significant courses are only approximately 69% of last year, which had a very low 26,000 acre feet of runoff. Soil moisture deficiency is perhaps more critical on much of the Gila drainage than on the Frisco, and the water required to satisfy this deficiency will absorb much, if not all, of that which is available in the present snow pack. Maximum snow accumulation occurs generally around March 1 and under normal conditions some additional snow could be expected. However, with the weather outlooks for warmer and drier than normal, the prospects are not good.

Verde River Drainage

Snow stored water in the higher elevations on this drainage amounts to an average of only approximately 60% of normal. In the Chalender area, the current report shows 1.8 inches as compared with an average of 3.9 inches, while on Mormon Mountain the comparable figures are 3.5 inches and 5.9 inches average. Here again serious precipitation deficiencies last fall and consequently poor soil moisture conditions will result in the absorption of large amounts of water by the soil before runoff can be anticipated. Unfavorable weather conditions are rapidly depleting the snow moisture supply.

Salt River and Tonto Creek Drainage

Snow conditions are very poor over practically all of this drainage. South exposures are almost entirely bare of snow except at the highest elevations or in protected locations, and similar dry soil conditions prevail here as elsewhere. With the weather outlook as it is, little chance exists of obtaining the very heavy storms that would be required to make a substantial improvement in water supply prospects.



Stream Flow Forecasts

On the basis of conditions existing as of this date, the following forecasts of water supply for the period January through May, inclusive, 1954, are made:

River	At	January - May	*Probable Limits of	
		Inclusive Discharge Forecast Acre Feet	Deviation from Forecast	Minimum Acre Feet
Salt River	Intake	72,000	Base Flow	148,000
Tonto Creek	Roosevelt	4,000	Base Flow	10,000
Verde River	Horseshoe	53,000	Base Flow	79,000
Gila River	Virden	12,000	Base Flow	18,000
Frisco River	Clifton	2,740	Base Flow	17,100

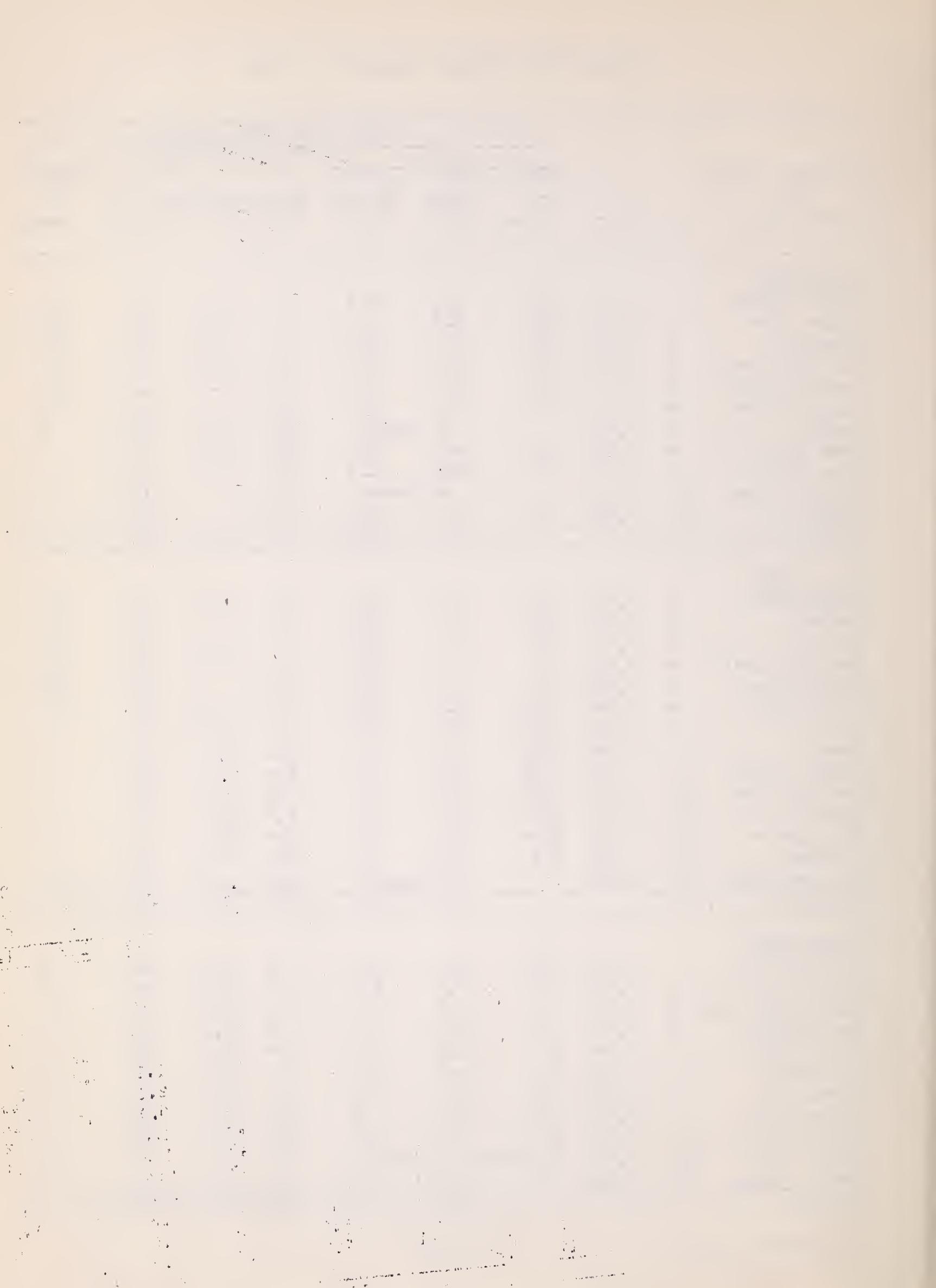
*Representing limits of one standard error.

Users of these forecasts should note they are based on statistically determined regression lines established by correlations between runoff, snow water content, and precipitation factors. Since the period of record is comparatively short (i.e. 16 years maximum for Arizona survey courses) and includes several years of unusual conditions, such as 1941, the distributional errors of sampling may well be rather large. The resulting spread between forecast and actual conditions will narrow progressively as the period of record becomes longer with consequent improvements in correlations and decrease in relative importance of the effect of the years of extreme variability.

ARIZONA SNOW SURVEYS FEBRUARY 1, 1954

DRAINAGE BASIN and SNOW COURSE	No.	Elev.	SNOW COVER MEASUREMENTS					Years of Record	
			Date of Survey	1954		Past Record			
				Snow Depth (In.)	Water Content (In.)	Water Content (In.)	Average		
GILA RIVER									
Frisco Divide	1	8,000	2/2	3.2	0.7	1.1	1.4	2.1	16
State Line	2	8,000	2/2	5.8	1.2	0.8	2.5	2.7	16
Nutrioso	3	8,500	2/2	1.6	0.6	0.4	3.6	2.4	16
Coronado Trail	4	8,000	2/2	2.4	0.7	1.1	5.2	3.5	16
Beaver Head	5	8,000	2/2	7.4	1.8	2.1	-	3.1	14
Taylor Creek	6	7,850	2/2	0.0	0.0	0.0	0.0	0.7	12
Inman	7	7,800		No Report		0.0	0.0	0.7	8
Rose Canyon	8	7,300	2/1	8.2	2.9	0.0	0.0	0.7	6
Bear Wallow	9	8,100	2/1	10.2	3.3	2.3	0.0	2.4	6
Black Canyon	10	6,790		No Report		0.0	-	0.0	1
Mogollon	11	7,000	2/2	3.2	1.1	0.0	-	0.0	1
Average				4.7	1.4	0.7	1.6	1.7	
SALT RIVER									
Forest Dale	1	7,000	1/31	3.2	1.0	0.0	0.0	1.2	14
McNary	2	7,200	1/31	8.4	2.3	1.1	T	3.0	15
Nutrioso	3	8,500	2/2	1.6	0.6	0.4	3.6	2.4	16
Coronado Trail	4	8,000	2/2	2.4	0.7	1.1	5.2	3.5	16
Beaver Head	5	8,000	2/2	7.4	1.8	2.1	-	3.1	14
Milk Ranch	5	7,000	1/31	6.8	2.2	0.9	0.0	1.8	13
Gentry	7	7,600	1/30	8.2	2.5	1.3	5.8	3.2	4
Heber	8	7,600	1/30	9.2	2.5	1.3	6.1	3.4	4
Canyon Creek	9	7,500	1/30	9.4	2.7	2.4	6.8	4.0	4
Maverick Fork	12	9,020	1/29	18.8	4.6	4.6	14.4	7.1	4
Baldy	13	9,125	1/29	21.6	5.0	4.3	12.3	5.9	4
Ft. Apache	14	9,160	1/29	25.8	5.6	5.0	12.6	6.0	4
Pacheta	15	7,800	2/1	7.2*	1.7	0.0	7.2	2.8	4
Workman Creek	17	6,900		No Report		6.0	0.0	3.0	2
Average				10.0	2.6	2.2	5.7	3.6	
VERDE RIVER									
Iron Springs	1	6,200	1/29	6.5	0.8	0.0	0.0	1.2	8
Camp Wood	2	5,700	2/1	9.3	2.1	0.0	0.0	1.2	8
Mingus Mountain	3	7,100	2/1	4.5	1.2	0.0	0.1	1.7	7
Mormon Lake	4	7,350	1/31	10.3	3.5	1.8	6.3	5.9	7
Fort Valley	5	7,350	2/1	4.9	1.2	1.4	7.0	3.3	7
Chalender	6	7,100	2/1	9.5	1.8	2.4	6.1	3.9	7
Munds Park	8	6,500	1/31	8.2	2.3	1.7	3.2	2.5	4
Casner Park	9	6,930	1/31	11.8	3.2	2.6	6.9	4.3	4
Mormon Mountain	11	7,500	1/31	11.8	3.4	3.9	9.3	5.5	4
Happy Jack	12	7,630		Measurement Delayed		1.4	6.4	3.3	3
Gaddes Canyon	13	7,600	2/1	13.0	3.6	-	-	-	0
Average				9.0	2.3	1.5	4.5	3.3	

*Estimated Quantity



ARIZONA SNOW SURVEYS FEBRUARY 1, 1954

DRAINAGE BASIN and SNOW COURSE		No.	Elev.	SNOW COVER MEASUREMENTS			Past Record			Years of Record
				Date of Survey	Snow Depth (In.)	Water Content (In.)	Water 1953	Content (In.) 1952	Average	
WILLIAMS RIVER										
Iron Springs	1	6,200	1/29		6.5	0.8	0.0	0.0	1.2	8
Camp Wood	2	5,700	2/1		9.3	2.1	0.0	0.0	1.2	8
Willow Ranch	3	5,000			No Report		0.0	-	1.0	7
Average					7.9	1.4	0.0	0.0	1.1	
LOWER COLORADO RIVER										
Bright Angel	1	8,400	2/1		17.2	4.3	4.5	17.5	8.4	6
Grand Canyon	2	7,500	2/1		4.5	1.4	0.6	4.3	2.8	6
Fort Valley	5	7,350	2/1		4.9	1.2	1.4	7.0	3.3	7
Chalender	6	7,100	2/1		9.5	1.8	2.4	6.1	3.9	7
Average					9.0	2.2	2.2	8.7	4.6	
LITTLE COLORADO RIVER										
Forest Dale	1	7,000	1/31		3.2	1.0	0.0	0.0	1.2	14
McNary	2	7,200	1/31		8.4	2.3	1.1	T	3.0	15
Nutrioso	3	8,500	2/2		1.6	0.6	0.4	3.6	2.4	16
Mormon Lake	4	7,350	1/31		10.3	3.5	1.8	6.3	5.9	7
Fort Valley	5	7,350	2/1		4.9	1.2	1.4	7.0	3.3	7
Gentry	7	7,600	1/30		8.2	2.5	1.3	5.8	3.2	4
Heber	8	7,600	1/30		9.2	2.5	1.3	6.1	3.4	4
Canyon Creek	9	7,500	1/30		9.4	2.7	2.4	6.8	4.0	4
Mormon Mountain	11	7,500	1/31		11.8	3.4	3.9	9.3	5.5	4
Happy Jack	12	7,630		Measurement Delayed			1.4	6.4	3.3	3
Average					7.4	2.2	1.5	5.1	3.5	

STATUS OF RESERVOIR STORAGE FEBRUARY 1, 1954

BASIN and STREAM	RESERVOIR	USABLE CAPACITY (Thous. A.F.)	THOUSAND ACRE FEET IN STORAGE ABOUT FEBRUARY 1					10-Yr. Average 1942-1951
			1954	1953	1952	1951		
Agua Fria	Lake Pleasant	178	32	82	119	1	13	
Colorado	Lake Havasu	683	611	586	644	618	574	
Colorado	Lake Mohave	1,810	1,678	1,603	1,596	1,336	-	
Colorado	Lake Mead	27,935	16,604	19,762	17,845	17,630	19,644	
Gila	San Carlos	1,285	..0	5	147	1	201	
Verde	Bartlett	180	4	22	155	6	29	
Verde	Horseshoe	143	2	14	63	2	5*	
Salt	Roosevelt	1,382	611	1,026	484	3	497	
Salt	Apache	245	244	238	174	174	193	
Salt	Canyon	58	54	57	47	45	25	
Salt	Saguaro	70	35	35	39	44	18	

*Average for years 1946 through 1951

LIST OF SNOW SURVEYORS

<u>SNOW COURSE</u>	<u>SURVEYOR</u>
Baldy	SCS and SRVWU
Bear Wallow	Wm. Hughes
Beaver Head	Jess Burke
Black Canyon	E. Van Winkle
Bright Angel	Valentine
Camp Wood	Mrs. C. C. Merritt
Canyon Creek	SCS and SRVWU
Casner Park	SCS and SRVWU
Chalender	V. J. Schroeder
Coronado Trail	Frank Casanova
Forest Dale	Wm. Fair
Frisco Divide	J. B. Shumate
Ft. Apache	SCS and SRVWU
Fort Valley	A. P. Loska
Gaddes Canyon	Richard Enz
Gentry	SCS and SRVWU
Grand Canyon	C. E. Lehnert
Happy Jack	Emil Ryberg
Heber	SCS and SRVWU
Inman	F. M. Inman
Iron Springs	Ernest Saxby
Maverick Fork	SCS and SRVWU
Milk Ranch	Wm. Fair
Mingus Mountain	Richard Enz
Mogollon	J. R. Wray
Mormon Lake	SCS and SRVWU
Mormon Mountain	SCS and SRVWU
Munds Park	SCS and SRVWU
McNary	Wm. Fair
Nutrioso	Frank Casanova
Pacheta	Foch Phillips
Rose Canyon	Wm. Hughes
State Line	J. B. Shumate
Taylor Creek	F. M. Inman
Willow Ranch	L. W. Miller
Workman Creek	C. L. Moore

The following organizations cooperate in the Arizona snow survey work:

FEDERAL

Department of Agriculture

Forest Service

Apache Forest

Coconino Forest

Coronado Forest

Gila Forest

Kaibab Forest

Prescott Forest

Sitgreaves Forest

Southwestern Forest and Range Experiment

Station, Fort Valley, Arizona

Sierra Ancha Forest Experiment Station

Soil Conservation Service

Department of Commerce

Weather Bureau

Arizona Section

Department of Interior

Bureau of Reclamation

Region III

Geological Survey

Arizona District

Bureau of Indian Affairs

Fort Apache Reservation

National Park Service

Grand Canyon National Park

Gila Water Commissioner, Safford, Arizona

IRRIGATION PROJECTS

Salt River Valley Water Users' Association,
Phoenix, Arizona

San Carlos Irrigation and Drainage District,
Coolidge, Arizona

SOUTHWEST LUMBER MILLS, INC., McNary, Arizona

Other organizations and individuals furnish valuable information for the snow survey reports. Their co-operation is gratefully acknowledged.

Federal - State - Private
COOPERATIVE SNOW SURVEYS

—
Furnishes the basic data
necessary for forecasting
water supply for irrigation,
domestic and municipal water
supply, hydro-electric power
generation, navigation,
mining and industry

—
“WATER IS THE WEST'S GREATEST RESOURCE”